Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

PROCEEDINGS
OF
THE ROYAL IRISH ACADEMY.

1839. No. 16.

March 16. (Stated Meeting.)

SIR WM. R. HAMILTON, A. M., President, in the Chair.

This being the day appointed by Charter for the annual election, the following Officers and Members of Council were chosen for the ensuing year :

President—Professor Sir Wm. Rowan Hamilton, A. M.
Treasurer—Thomas Herbert Orpen, M. D.
Secretary—Joseph Henderson Singer, D. D.
Secretary to Council—Rev. Humphrey Lloyd, A. M.
Secretary of Foreign Correspondence—Sir Wm. Betham.
Librarian—Rev. William Hamilton Drummond, D. D.

Committee of Science.

Rev. Franc Sadleir, D. D. Provost of Trinity College ; Rev. Humphrey Lloyd, A.M.; James Apjohn, M.D.; James Mac Cullagh, LL.D.; William Stokes, M. D.; Rev. William Digby Sadleir, A. M.; Robert Ball, Esq.

Committee of Polite Literature.

His Grace the Archbishop of Dublin; Rev. Joseph H. Singer, D. D.; Samuel Litton, M. D.; Rev. William H. Drummond, D. D.; Rev. Charles Richard Elrington, D. D.; Rev. Charles William Wall, D. D.; Rev. Thomas H. Porter, D.D.

Committee of Antiquities.

Thomas Herbert Orpen, M. D.; Sir William Betham; George Petrie, Esq.; Rev. Cæsar Otway, A. B.; the Very Rev. the Dean of St. Patrick's; Rev. James Henthorn Todd, B. D.; Henry J. Monck Mason, LL.D.

The President under his hand and seal appointed the following Vice-Presidents:

His Grace the Archbishop of Dublin; the Provost; Samuel Litton, M. D.; Rev. Humphrey Lloyd, A. M.

The Committee appointed to examine the Treasurer's Accounts reported as follows:

"We have examined the above Account,* with the vouchers produced, and have found it to be correct; and we find that there is a balance in bank of £160; and in the Treasurer's hands £112 6*s.* 10*d.*, making a total balance of £272 6*s.* 10*d.* sterling.

"(Signed,)

"Franc Sadleir,
"Samuel Litton."

"*March* 9*th*, 1839."

"The Treasurer reports that there are the following portions of Stock in the Bank of Ireland to the credit of the Academy:

"£1500 in 3 per Cent. Consols.

"£1500 in 3½ per Cent. Government Stock, being the Cunningham Fund.

"(Signed,)

"Franc Sadleir,
"Samuel Litton."

"*Dec.* 31*st*, 1838."

---

* Entered in the Treasurer's Book.

Dr. Apjohn read a paper on the Analysis of the Water of the Dead Sea.

After some general remarks upon the geographical position, extent, and depth of the Dead Sea, the geological structure of the surrounding country, and the different statements handed down by the older historians, and to a certain extent corroborated by modern travellers, in reference to the excessive density of its waters, and the absence from them of living things, both animal and vegetable, Dr. Apjohn gave a historical sketch of the analytical researches, in reference to this water, of Lavoisier, Marcet, and Klaproth.

The specimen which he examined, he stated to have been recently brought to this country by George James Knox, Esq., from Syria, and to have been committed to him for analysis by the Rev. Thomas Knox, both members of the Academy, and authors of valuable scientific communications, read at our meetings, or published in our Transactions. A number of experiments were now detailed, having for their object to determine the nature of the saline constituents of the water, and illustrate its composition and properties. Its specific gravity was set down as 1153, and its boiling point as 221°. Its contained salts were enumerated as sulphate of lime, chloride of calcium, chloride of magnesium, bromide of magnesium, chloride of potassium, chloride of sodium, chloride of manganese, and sulphate of lime; the chloride of potassium and manganese, and the bromide of magnesium having, as he thought, up to the time of the completion of his analysis, been first detected by himself. It held in solution an unusually small amount of air.

The following is an outline of the method of analysis employed.

To approximate to the quantity of saline matter, a known weight of the water was evaporated to dryness, and finally heated to about 400°. The residuum amounted to 18.91 per cent.

During the evaporation, a portion of the chloride of magnesium was decomposed, and water being poured on, the amount of magnesia left undissolved was determined.

To the solution, oxalate of ammonia was added in excess, by which the lime was obtained; and, this being separated, the remainder of the magnesia was insulated in the usual manner, by boiling with carbonate of potash, evaporating to dryness, &c.

To check the determination of the magnesia, the following method was taken. A known weight of the water was boiled with excess of lime, by which the magnesium and manganese were separated and replaced by calcium. The amount of this latter metal (the free lime being, of course, first removed by carbonic acid, boiling, &c.) was then determined by oxalate of ammonia, and subtracting from it the calcium of the water as previously determined, the remainder was the calcium which replaced the magnesium and manganese. This remainder (the manganese being present in very minute proportion) was found to be almost exactly what it should be, supposing it to replace nothing but magnesium, or it was to the magnesium directly determined in the ratio of the atomic weights of the two metals.

The solution, deprived of magnesia, lime, and manganese, was now evaporated to dryness, and ignited so as to expel the ammoniacal salts, and the residue gave the mixed chlorides of potassium and sodium, with a trace of sulphate of potash. The quantity of chloride of potassium in this mixture was determined in the usual way, by the bichloride of platinum, and the difference gave the chloride of sodium. The numbers thus obtained, some spattering having occurred during the expulsion of the ammoniacal salts, were looked upon as only relatively true, and were corrected in the following manner.

The chlorine and bromine having being determined, as shall be presently described, as also the different metals, with the exception of the alkaline ones, and the bromine being supposed united with magnesium, and a deduction made from the calcium for the small amount of sulphate of lime present, it was easy, by giving to the manganese and earthy metals their proper proportions of chlorine, to infer the quantity of this principle united with the potassium and sodium. Let this quantity, which was found greater than what resulted from the direct determination of the chlorides of these metals, be called w, and let m be to n in the ratio of the chloride of potassium to the chloride of sodium, as already determined. Let x, also, be the true weight of the chloride of potassium, y the true weight of the chloride of sodium, a the ratio of the atomic weight of chloride of potassium to chlorine, and b that of chloride of sodium to chlorine. We will thus obviously have the two following equations:

$$an + by = w; \text{ and, } nx = my;$$

from which we readily deduce

$$x = \frac{mw}{ma + nb}; \text{ and } y = \frac{nw}{ma + nb}.$$

From a fresh portion of the water the sulphuric acid was got by nitrate of barytes, and the sulphate of barytes having been separated, the chlorine and bromine were thrown down in union with silver.* To infer, however, from this mixed precipitate, the chlorine, it was necessary to estimate the bromine present by a distinct process.

With this view, a strong aqueous solution of chlorine was mixed with a known weight of the water under analysis, and the bromine liberated was removed by repeated washings with ether. From the etherial solution, the bromine mixed with some chlorine was separated by barytic water, and the ether being distilled off, the residue was evaporated to dryness, and ignited, so as to reduce any bromate and chlorate of barytes formed to bromide and chloride of barium. These salts were dissolved in water, deprived by carbonic acid and boiling of free barytes; again evaporated to dryness, ignited, and accurately weighed. Water being poured on, they were re-dissolved, and converted, by the addition of nitrate of silver, into a mixture of the bromide and chloride of silver, which was also accurately weighed. Now, if w be the weight of the mixed bromide and chloride of barium, w' that of the mixed bromide and chloride of silver, x the chlorine, y the bromine, m the ratio of the atomic weight of chloride of barium to chlorine, n that of the atomic weight of bromide of barium to bromine, m' the ratio of the atomic weight of chloride of silver to chlorine, and n' that of the atomic weight of bromide of silver to bromine, we will have the following equations:

---

* The excess of silver having been separated from the solution, by chloride of sodium, the manganese was thrown down by the addition of hydrosulphate of ammonia. This metal was also estimated by the process recommended by Stromeyer.

$$mx + ny - w, \quad \text{and } m'x + n'y = w',$$

from which we get

$$y = \frac{mw' - m'w}{mn' - m'n}.^{*}$$

Having thus obtained the bromine, the chloride was easily inferred from the mixed chloride and bromide of silver, already got by adding nitrate of silver to the water. The following are the final results.

Chloride of calcium,	2.438	= 18.78.
Chloride of magnesium,	7.370	
Bromide of magnesium,	0.201	
Chloride of potassium,	0.852	
Chloride of sodium,	7.839	
Chloride of manganese,	0.005	
Sulphate of lime,	0.075	
Water,	81.220	
	100.	

---

[*] This method answers well, the atomic weight of bromine being so much greater than that of chlorine, and is susceptible of far greater accuracy than any more direct one, having for its object the insulation of the bromine.

When the analysis was completed, with the exception of the quantitative determination of the bromine, Dr. Apjohn became aware that in the discovery in the water of the Dead Sea of the potassium, manganese, and bromine, he had been anticipated by M. C. G. Gmelin, who has assigned to it the following composition.

Specific gravity = 1212.

Chloride of calcium,	3.2141	= 24.5398.
Chloride of magnesium,	11.7734	
Bromide of magnesium,	0.4393	
Chloride of potassium	1.6738	
Chloride of sodium	7.0777	
Chloride of manganese	0.2117	
Chloride of ammonium,	0.0896	
Chloride of aluminum,	0.0075	
Sulphate of lime,	0.0527	
Water,	75.4602	
	100.	

After having seen this analysis, Dr. Apjohn stated, that he again looked for alumina and ammonia, but could not detect the slightest trace of either. The quantities, however, of these principles found by Gmelin were so small, that their non-appearance in Dr. Apjohn's analysis cannot be considered as a material discrepancy. But there are other striking differences.

The density of the specimen examined by Gmelin, and its percentage of saline matter were considerably higher than those which belonged to the water analyzed by Dr. Apjohn, a circumstance easily accounted for, by the fact of the latter having been collected about half a mile from the embouchure of the Jordan, and towards the close of the rainy season. But notwithstanding this, it might have been anticipated, that the results of both for the different salts should be relatively the same; such, however, is far from being the case. The ratio of the chloride of magnesium to the chloride of calcium is much greater, and of the chloride of sodium to the chloride of potassium, much smaller with Gmelin than with Dr. Apjohn. The quantities also of the bromide of magnesium and chloride of manganese, as determined by Gmelin, are, as respects Dr. Apjohn's numbers, disproportionately great, and, what is very singular, the amount of the chloride of sodium obtained by Gmelin is absolutely less than that got by Dr. Apjohn, though the total amount of saline matter in the water examined by the former, is to that in the specimen examined by the latter, very nearly in the ratio of 4 to 3.

It is not easy to explain such discrepancies, but assuming both analyses as correct, we arrive at the conclusion, that the waters of the lake in question are subject to a variation of constitution, affecting not only the relation of the saline matter to the water, but the proportions also which the different salts bear to each other.

Mr. Bergin exhibited to the Academy, the results of some experiments with photogenic paper, prepared after the method of Mr. Talbot.

RESOLVED,—That the Academy do condole with the family of Dr. Perceval, one of the original Members of the Academy, and its first Secretary; and that the Secretary be requested to draw up the expression of its condolence.

RESOLVED,—That the thanks of the Academy be given to the Marquis of Normanby for the manuscript of the late General Vallancey, presented by him to the Academy; and that the President be requested to communicate the same.

DONATIONS.

Manuscript Volume of the late General Vallancey. Presented by the Marquis of Normanby.

The Rights of Animals. By the Rev. W. H. Drummond. Presented by the Author.

Astronomical Observations made at the Cambridge Observatory, by the Rev. James Challis, M. A. Presented by the Author.

Tables of Logarithms. Presented by the publishers, Messrs. Taylor and Walton of London.

Political Medicine. By T. H. Maunsell, M. D. Presented by the Author.

Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences. Par MM. les Secretaires Perpetuels. Nos. 2—7. Premier Semestre, 1839. Presented by the Academy.

April 8.

SIR WM. R. HAMILTON, A. M., President, in the Chair.

Thomas Rhodes, Esq., and John U. Owen, M. D., were elected Members of the Academy.

Professor Lloyd laid on the table of the Academy, the apparatus for experiments on the rectilinear, elliptic, and circular polarization of light, invented by M. Dove of Berlin; also two sets of Fraunhofer's gratings, presented to him by Edward Cooper, Esq. M.P., by whom they were brought from Munich.

Dr. Wilde, a visiter, by permission of the Academy, read a paper on some Discoveries he had made at Tyre, relating to the manufacture of the celebrated Purple Dye.